Review of Restrictions on the Use of Methyl Bromide

A Report to the Legislature

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Executive Summary

This report was prepared pursuant to Section 2 of Senate Bill 1 (Chapter 1, Statutes of 1995-96 Third Extraordinary Session) which states, "It is the intent of the Legislature that the Department of Pesticide Regulation (DPR), in cooperation with the Department of Food and Agriculture by July 1,1996, review the current practices in the use of methyl bromide and consider the amendment of permit conditions or the promulgation of regulations to prevent any unreasonable risk of harm to employees and the public while accomplishing the objectives of soil, commodity, and structural fumigation. The review should include, but need not be limited to, injection depths, field barriers, buffer zone parameters, warning signs, field security, and the feasibility of strengthening local agency regulation where appropriate."

Methyl bromide use practices--defined in California by product label restrictions, regulations, and permit conditions--have been developed over the past decade and more. However, the current use practices referenced in the above legislation are the result of a series of use modifications developed by DPR beginning in 1992 that have continued to evolve as more data have become available. The principle guiding their development is that methyl bromide use should not lead to exposures that pose a risk to the health of workers or the public.

The California restrictions placed on methyl bromide exceed national standards. Under the pesticide regulatory framework, the U.S. Environmental Protection Agency (U.S. EPA) regulates pesticide use practices through product labeling. States are not allowed to amend labeling, but can use other regulatory tools to ensure that pesticide uses do not pose an unreasonable risk based on local conditions.

DPR imposed regulatory measures on the use of methyl bromide in April 1992 by promulgating emergency regulations placing strict controls on structural fumigations. U.S. EPA subsequently mandated these structural control measures nationally by placing the restrictions on the product label. Beginning in January 1993, DPR implemented a series of restrictions on methyl bromide use in field and commodity fumigations to protect workers and others who may be near fumigation sites. These measures have not been adopted by U.S. EPA. California continues to lead the nation in protecting people from unacceptable exposure to methyl bromide.

For this report, DPR in cooperation with the California Department of Food and Agriculture (CDFA) reassessed the current use practices and the science upon which they are based. This review found that the controls placed on methyl bromide were developed using sound science and methodology and are adequate to prevent unreasonable risk to employees and the public. The review encompassed injection depths, field barriers, buffer zone parameters, warning signs, field security, and local restrictions. In the process, DPR considered whether it had employed the appropriate models in projecting off-site exposure potential and whether it should conduct additional monitoring of methyl bromide applications under varying geographic and meteorological conditions to verify the effectiveness of the models.

DPR will continuously evaluate use practices to ensure that methyl bromide use does not pose an unacceptable risk. Although the review to date indicates that substantial changes are not needed, fine-tuning of protective measures will occur when necessary. For example, a disproportionate number of injuries among workers using methyl bromide to spot-treat tree holes may prompt changes in protective equipment requirements or training for these workers.

DPR also recommended recently to the county agricultural commissioners that they require stricter controls of methyl bromide use around schools to provide an extra measure of protection. In addition, DPR has instructed the commissioners not to consider backyards and schoolyards to be part of a buffer zone. DPR also plans supplemental monitoring to provide additional validation of the buffer zones. In addition, DPR is developing statewide regulations for structural fumigation to supplement the requirements of existing methyl bromide labels. Additional toxicology data from chronic exposure studies on methyl bromide are expected to be submitted by the end of 1997. Should review of these and other data show that methyl bromide use poses an unacceptable chronic risk, additional regulatory measures may be required, up to and including suspension of certain uses.

Action is being taken nationally and internationally because of methyl bromide's impact on stratospheric ozone. Methyl bromide has been listed as an ozone-depleting substance under an international treaty that governs the global production and trade of ozone-depleting substances. The treaty partners agreed to freeze methyl bromide production at 1991 levels, and developed countries are slated to phase out use of the chemical by 2010. In 1997, the treaty partners will discuss a schedule for phaseout in

developing nations. In addition, the industrialized nations also agreed to decrease their methyl bromide use 25 percent by 2001 and 50 percent by 2005. The international phaseout schedule is less stringent than that mandated in the U.S. by the Clean Air Act. Under the Clean Air Act, U.S. EPA has mandated a phaseout of U.S. production and importation (not use) by 2001. These atmospheric considerations, being international by their very nature, have not been the focus of regulatory actions taken in California, which have centered on ensuring that the public health is not compromised by exposure to unacceptable levels.

Review of Regulatory Authority

The sale and use of methyl bromide in California are regulated at the federal, state, and local levels through the pesticide label use requirements as registered by U.S. EPA and by enforcement authority in the California Food and Agricultural Code (FAC) and the California Code of Regulations, Title 3 (3 CCR). This includes the delegation of authority at the local level to the county agricultural commissioners to control the use of certain pesticides designated as restricted materials through a permitting process.

Federal Control – The Pesticide Label

U.S. EPA regulates the use of pesticides primarily through the product label. Pesticide labels give the user explicit and legally binding instructions for the storage, handling, and use of that pesticide. Using a pesticide in a way that is inconsistent with written label requirements is a violation of federal and state law. All pesticide labels (including those on methyl bromide products) have protective statements covering emergency care; physical, chemical and environmental hazards; spill and leak procedures; storage and handling standards; requirements, if applicable, to post warning signs and notify workers in the area; required personal protective equipment; and specific use directions including maximum application rates and aeration procedures. Under federal law, a state cannot amend label language.

California Pesticide Regulatory Program

The requirements of the pesticide regulatory program are covered in Divisions 6 and 7 of the California FAC and Division 6, 3 CCR. The statutes in the FAC govern the registration and use of all pesticides. Regulations in 3 CCR are promulgated to carry out the FAC. The FAC and CCR authorize the Director and the county agricultural commissioners to administer and enforce the pesticide regulatory program.

DPR's review of toxicology and other studies received in late 1991 prompted an evaluation of the toxicological significance of methyl bromide levels in air after structural and agricultural fumigations with the pesticide. DPR scientists conducted a preliminary risk assessment based on acute toxicity studies rather than waiting for the full complement of chronic toxicology studies, which were not scheduled for submission until 1996. (The final chronic toxicology study is now not scheduled to be submitted until December 1997.)

This risk assessment established a new, and significantly lower, acceptable human exposure level for acute exposure to methyl bromide in ambient air. The acceptable human exposure level was calculated to be 0.21 parts per million (ppm) as a 24-hour time-weighted-average concentration, a 20-fold decrease from the 5 ppm ambient air level previously considered protective.

To accommodate this new reduced exposure level, DPR developed revised methyl bromide use requirements to limit human exposure to acceptable levels using four concepts: containment, dilution, distance, and time. In practice, containment means that fumigation equipment and fumigation structures should leak as little methyl bromide as possible. Dilution means that when methyl bromide is not fully contained, it must be diluted with fresh air. Distance refers to keeping distance between the fumigant and people--those involved in the treatment and others. Time refers to minimizing the time people are exposed to methyl bromide. The permit conditions and regulations are based on empirical monitoring data conducted by methyl bromide producers and distributors, methyl bromide users, academic researchers, the Air Resources Board (ARB) and DPR. The California requirements are summarized below.

Local Control - Restricted Material Permits: Methyl bromide when used in agricultural production is classified as a restricted material. Possession and use of restricted materials are allowed only under a permit from the county agricultural commissioner. Before issuing a permit, the county agricultural commissioner must evaluate the application to determine whether it will cause environmental harm. Depending on the results of this review, the commissioner may deny the permit or impose permit conditions including the use of specified mitigation measures. In evaluating permit applications, commissioners must consider and, where appropriate, use information provided by the Director. For methyl bromide, DPR provides this information as suggested permit conditions. The suggested permit conditions represent minimum mitigation measures based on DPR's analysis of available data. County agricultural commissioners can impose more stringent permit conditions to address the need for additional mitigation measures dictated by the environment at the application site.

After the new acceptable exposure level was established, DPR began developing new use practice restrictions for agricultural applications that would incorporate a one-day (24-hour) exposure level of 0.21 ppm for workers and the public. Because a permit is required for agricultural uses of methyl bromide, DPR determined that local regulation via

permit conditioning was the most appropriate regulatory tool. The suggested permit conditions developed by DPR are designed to ensure that neither workers nor the public is exposed to levels of methyl bromide greater than the equivalent of 0.21 ppm per day. The permit conditions include equipment modifications and restrictions on work hours as well as reductions in application rates, limits on acreage treated, tarpaulin specifications, injection depth limitations, restricted entry intervals, and establishment of buffer zones. (U.S. EPA has not adopted these restrictions nationally, and California is the only state using these strict methyl bromide use practices.) The details of these practices and their development are outlined under "Development of Mitigation" below.

State Regulations: Methyl bromide has been classified as a restricted material for all pesticide uses since January 1973. Early regulation of agricultural use relied heavily on permit conditions. Later most of these permit conditions were incorporated into regulation. For soil treatment, these regulations addressed depth of injection (six inches); use of a gas-confining tarp with the edges buried under four inches of firmly packed soil; containment time before removing tarps (48 hours); and procedures to reduce unnecessary loss when the injection equipment was lifted from the soil. For nursery and commodity fumigation, the regulations addressed containment, injection to minimize gas loss, and security. The county agricultural commissioner also had authority over the length of the fumigation period. Regulations on structural use of methyl bromide required chloropicrin as a warning agent and the use of fans to uniformly disperse both the gas and warning agent within the structure.

Following the establishment of a new acceptable exposure level in 1991, DPR reassessed the state regulations and the federal label restrictions covering structural uses of methyl bromide. Then, the label allowed people to reenter their homes following a methyl bromide fumigation when measured ambient air reached 5 ppm. Since restricted materials permits cannot be required for structural methyl bromide applications, DPR promulgated emergency regulations mandating longer aeration times and a lower acceptable ambient air level for the reoccupation of homes following structural fumigation with methyl bromide.

DPR discussed the emergency regulations and the data upon which they were based with U.S. EPA. In the fall of 1992, U.S. EPA required that registrants incorporate DPR's aeration procedures and fact sheet on labels of pesticides containing methyl bromide used for structural fumigation.

Once the label requirements were in place, the state emergency regulations were no longer needed and they were allowed to lapse. A further discussion of current work on methyl bromide regulations is included under "Development of Mitigation" below.

Development of Mitigation Measures

In developing mitigation measures, DPR relied on monitoring data and empirical models along with direct observation of use practices and application equipment.

Evaluation of Exposure

Monitoring Data: After the 1992 preliminary risk assessment, DPR requested the producers, distributors, and users of methyl bromide to submit monitoring data for a variety of uses. In addition, DPR conducted its own studies. This monitoring was designed to assess exposures to applicators and other workers involved in the application of methyl bromide and to assess potential exposures to people in areas next to fields treated with methyl bromide (off-site exposure). Field, commodity, and structural applications were monitored. Field fumigations monitored included with and without tarpaulins, using shallow and deep injection, flat field (broadcast) and bedded field applications, and greenhouse applications. Commodity fumigations monitored included chamber, tarpaulin, transportation container, warehouse, food processing plant, and potting soil.

Preliminary monitoring studies showed that without changes to use practices, exposures could exceed the target level (0.21 ppm, 24-hour time-weighted average) and that additional restrictions were necessary to provide an adequate margin of safety.

Use of Exposure Models: A major drawback to off-site monitoring is that it can only determine air concentrations at specific locations at specific times. Extrapolating these data to other locations and times generally cannot be done without the assistance of computer models. DPR pioneered the use of pesticide monitoring data in conjunction with a U.S. EPA computer model commonly used to predict industrial air pollution levels. The computer model, called the Industrial Source Complex-Short Term (ISCST) model, had not previously been applied to agricultural

situations. The model predicts air concentrations based on characteristics of the pollution source (e.g., rate of emission and dimensions of emitting area), weather conditions at the time of emission (e.g., wind speed, wind direction, atmospheric stability), and terrain over the downwind area (elevation, and urban or rural geography). While the weather and terrain for every methyl bromide study were documented, the rate of emission or flux rate was not determined for most studies. DPR developed a method for computing a "flux index" and used it in the ISCST model.

This methodology differs from guidelines issued by the California Air Pollution Control Officers Association (CAPCOA). Those guidelines were designed to use the ISCST model to calculate buffer zones around industrial sources (which typically emit pollutants year-round with the amount of emission unaffected by weather) and were not appropriate to methyl bromide use in agriculture (which occurs only a few days each year and whose emission rate is greatly influenced by weather conditions). Buffer zones calculated using the CAPCOA method are frequently larger than those calculated using DPR's method; however, empirical data have demonstrated that the buffer zones calculated by DPR are protective. (See Appendix for a more detailed discussion of the differences between the DPR and CAPCOA methodology.)

Mitigation of Exposure

Field Applications: DPR obtained measurements to assess typical exposures of applicators who handle methyl bromide, including tractor drivers, their assistants, and field workers. Most studies addressed soil application methods in common use and important to cultivation of a specific type of agricultural crop. Application methods that provided adequate control over the fumigation process and worker exposure were examined. For these application methods, the various engineering and administrative controls operating during the monitoring were adopted as recommendations for permit conditions. In other cases, new application methods were developed to obtain the desired exposure levels.

As additional monitoring was conducted, improved application methods were developed to reduce exposure. Examples of engineering controls developed to mitigate applicator exposure include the use of an air-fan dilution system for some application tractors, limits to the rate applied per acre, the use of improved injection shanks, minimum injection depths, adjusting the spacing of the injection shanks, and development of

specialized mechanical equipment, such as closing shoes and rollers that immediately cover and compact the injection hole. To reduce further exposure to workers, engineering and administrative controls were imposed on tarpaulin removal activities, and high-barrier tarpaulins were required for tarpaulin-covered applications. These improved designs reduce exposure by keeping more of the fumigant in the soil and, consequently, out of the air which workers are breathing.

To verify that these new techniques achieved an acceptable exposure level, approximately 2,000 off-site air samples were collected during 20 applications. Verification monitoring was conducted for a variety of application methods, such as applications with and without a tarpaulin, shallow injection and deep injection, treatment to a flat field (broadcast), and treatment to a bedded field.

Verification monitoring demonstrated that when the new application techniques were used, exposures did not exceed the acceptable level. Consequently, these engineering and administrative controls were adopted as recommendations for permit conditions. Presently, there are 12 primary application methods (with several minor variants of some methods) recognized as protective in the permit conditions for soil fumigation. There are separate suggested permit conditions for greenhouse soil and potting soil that were developed from other types of soil fumigation and industry methods shown to be effective at control of exposure. In addition, maximum daily work hours were limited to prevent overexposure.

Commodity Applications: Commodity fumigations are conducted under tarpaulins, in shipping containers, truck trailers, warehouses, and in chambers specifically designed for fumigation. Common to all the types of commodity fumigation is the basic process of fumigant introduction, treatment time, aeration, and management of the treated commodity. These common processes allowed development of uniform mitigation measures for commodity fumigations.

The primary focus of the commodity permit conditions also considered the four basic control strategies: containment, dilution, distance, and time. As with field applications, recommendations for permit conditions for commodity fumigation came directly from evaluating monitoring data.

Containment of methyl bromide in chambers is critical to reduce exposure. U.S. Department of Agriculture (USDA)-certified chambers were found the best at containing the fumigant. These chambers must pass a pressure

test to be acceptable to the USDA for quarantine purposes. For chambers that cannot pass USDA pressure testing, an alternate method of testing was developed. This test, called a retention test, allowed an intermediate class of containment. A third category includes untested chambers and fumigation conducted under tarpaulin covers. Buffer zones were found necessary to provide additional safety since all types of containment leak to some extent.

Some minimum aeration times used at various sites are required by product labeling or specified by USDA for fumigation. The amount of methyl bromide retained by the commodity itself during fumigation and the rate at which the fumigant is released following fumigation (during storage or processing) is different for each commodity. With this knowledge, DPR sought to maintain acceptable worker exposure levels by extending aeration times beyond those required by the pesticide label and by establishing strict protocols for the management of the treated commodity following fumigation. Different recommendations were established for aeration employing mechanical ventilation equipment and for aeration by passive means. Because the minimum aeration times may not be adequate for all commodities, DPR developed permit conditions requiring testing of enclosed areas used for storage of the fumigated commodity to ensure that adequate aeration has been accomplished and acceptable levels have been attained. The conditions also limit the time workers can be in these areas. The result of the permit conditions for commodity fumigation ensure that people are not exposed to methyl bromide above the target exposure level.

Structural Applications: Some years ago, DPR staff in cooperation with a fumigation industry group conducted monitoring to develop and validate a procedure that would allow tarpaulin removal without necessitating cumbersome respiratory protection for workers. As a result, an aeration plan was developed to reduce worker exposure during tarpaulin removal. The plan became an industry standard in the State. After the acceptable exposure level was reduced in 1992, DPR reevaluated the tarpaulin removal procedure and found it complied with the revised target exposure value.

Beginning in 1992, DPR conducted additional monitoring of structural fumigations focusing on off-site methyl bromide concentrations. The results of this work are being used by DPR staff to develop methods that will provide greater control over off-site movement of methyl bromide, both during the treatment phase and the aeration phase. These changes

may benefit fumigation crew workers by increasing control over the entire fumigation process, thereby further decreasing potential worker exposure. DPR is currently developing additional regulations covering structural fumigation with methyl bromide to carry out these changes.

Mitigation of Public Exposures

Buffer Zones: As has been discussed previously, the 0.21 ppm target level for methyl bromide is based on a 24-hour continuous exposure. For example, a person could be exposed to 0.42 ppm for 12 hours or 0.63 ppm for eight hours without exceeding the 0.21 ppm, 24-hour time-weighted average. Accordingly, buffer zones are dependent upon the time a person will remain in the area. The buffer zone is not an exclusion zone; people can walk or drive through a buffer zone and still not be at risk because they are spending only a short period near the application site. Buffer zones calculated for residential areas assume that people will be in the area for 24 hours. For work-site activities, buffer zones were calculated assuming that workers would be near treated areas for 12 hours.

A conservative set of assumptions is used to ensure that buffer zones provide adequate protection. Buffer zones extend in all directions around a treated field. Although for any given application, data show it is only necessary in the downwind direction. The buffer zones listed in the permit conditions are larger than necessary because they were computed assuming the worst-case scenario--a person remaining outdoors and downwind of a treated field for 12 to 24 hours during unfavorable weather conditions, such as low wind speed and stable air. Under less severe conditions, the distance necessary to provide an adequate margin of safety would be shorter.

Validation of Buffer Zones: After DPR drafted the permit conditions but before they were implemented (and again in conducting this review), DPR evaluated the studies used to establish the mitigation measures and examined the actual air monitoring data gathered around the fields where applications had occurred. Based on this monitoring data, DPR calculated the size of buffer zones needed to meet the 0.21 ppm target level. This was compared with the size of the buffer zone calculated by the model. More than 1,000 field-measured air samples were analyzed from 11 fumigations. In all 11 cases, the buffer zones provided at least a 100-fold margin of safety. In fact, the buffer zones were on average about 25 percent larger than they needed to be for safety.

Monitoring to validate the size of the buffer zones was done in the summer months, which represents the worst-case conditions. (More methyl bromide is emitted in warmer weather because the emissions are governed by adsorption and diffusion through soil. See Appendix for further discussion of methodology.) However, concerns have been expressed by some that the buffer zone calculations should be verified for winter weather conditions. Therefore, DPR intends to further verify the methodology for calculating buffer zones by monitoring air concentrations of methyl bromide in buffer zones during the winter of 1996. From November 1996 through February 1997, DPR plans to monitor off-site ambient air levels from various types of methyl bromide field applications.

Sign Posting and Field Security: Before a methyl bromide permit can be issued, the prospective permittee must determine if there are sensitive areas near the application site. Some examples of sensitive areas include occupied residences, hospitals, schools, work sites, agricultural field workers in adjacent fields, and recreational areas such as golf courses and parks. Before approving the permit, the county agricultural commissioner must evaluate activities next to the treated area and determine whether the buffer zone is adequate. The commissioner may require that an application method be modified by reducing treated acreage, or that the application be postponed until activity within the buffer zone has ended (for example, school is not in session).

Sign posting is a key element of the regulatory scheme. All methyl bromide applications must be conspicuously posted with red-and-white warning signs that include a "skull and crossbones" drawing; the words "DANGER-FUMIGATION" in English and Spanish; the name of the fumigant; date and time of the application; and the name, address, and telephone number of the applicator. The signs are required at all entrances to a field, greenhouse, or fumigation enclosure. Also, for field fumigations, warning signs must be posted every 600 feet along an unfenced public right-of-way. The warning signs must remain posted until aeration is complete, when the operator of the property must remove them.

Evaluation of 1994-1996 Illness Data

The series of restrictions DPR has implemented on the wide-range methyl bromide uses became fully effective in 1994. Since then, there have been 16 reported incidents in which illnesses were determined to be definitely or probably related to methyl bromide exposure. All incidents were

investigated by the agricultural commissioner in the county in which they occurred. Fourteen of the 16 incidents involved exposures to persons who were working and two involved nonworker exposures.

Of the nonoccupational exposures, one incident involved tarp failure and the other involved persons reentering a treated structure before the gas had fully dissipated.

Seven of the employee incidents were the result of equipment malfunctions (broken valves, clogged probe, torn or loose tarp, etc.). The remaining employee incidents resulted from improper application techniques which fell into two types of activities--tarp sealing (workers seal the edges of the tarps by shoveling dirt over them) and tree hole fumigation.

Analysis of the data from the illness reports has prompted DPR to reevaluate use practices involved in tarp sealing and tree hole fumigation. Revised suggested permit conditions, designed to provide additional safeguards for workers involved in these activities, are being developed.

Methyl bromide applications have been given a high priority for inspections to verify compliance with permit conditions and regulatory requirements. Although inspections have found that the restrictions placed on the use of methyl bromide are being complied with in most instances, there have been instances of noncompliance.

Commissioners have taken a variety of enforcement actions ranging from the issuance of notices of violation to civil penalties of up to $3,000. DPR and the county agricultural commissioners will continue to place a high priority on ensuring compliance with the restrictions placed on the use of methyl bromide.

Conclusions

After reviewing the current practices of the use of methyl bromide, several conclusions can be drawn about whether amendments to permit conditions or the promulgation of regulations are necessary to prevent unreasonable risk of harm to employees and the public while accomplishing the objectives of soil and commodity fumigation. The control strategies to prevent this level of exposure rely on four principles: containment, dilution, distance, and time. DPR has used empirical, real-world data to

validate the steps it has taken to protect workers and the public from harmful levels of methyl bromide.

One area of special concern has been the use of methyl bromide around schools. Although the restrictions placed on methyl bromide have been demonstrated protective, in response to public concerns some agricultural commissioners have imposed additional restrictions on these sites. Special conditions include prohibiting application and/or aeration while school is in session or when children are present on school grounds; allowing applications only on weekends; increasing the size of buffer zones; and requiring the grower to notify the principal of a school 24 hours before an application near that school. DPR recommended recently to the county agricultural commissioners that they require stricter controls of methyl bromide use around schools to provide an extra measure of protection. In addition, DPR has instructed the commissioners not to consider backyards and schoolyards to be part of a buffer zone.

Substantial changes in the permit conditions for the agricultural use of methyl bromide are not necessary at this time. The restrictions, which go beyond those required by U.S. EPA, were developed after extensive air monitoring around fumigation sites by DPR and ARB. DPR combined this monitoring with computer simulation models that accurately predict levels of methyl bromide in air under varying application scenarios at various distances from the application site. This information was combined with toxicity data to determine an adequate margin of safety designed to protect people who might be in the area of a fumigation. Buffer zones extending beyond the area treated have been developed which vary in size depending on how much pesticide is used, application techniques, and barrier properties of field tarps or application chambers. The resulting permit conditions achieve compliance with the target value for human exposure. DPR has and will continue to evaluate the effectiveness of these protective measures, making changes when needed. For example, a review of recent illness data demonstrated isolated problems with certain applications or tasks, specifically tree hole fumigation and workers shoveling dirt onto tarps. DPR is determining whether stricter permit conditions (such as additional protective equipment or training) are needed to prevent these overexposures.

The review of local agency (county agricultural commissioner) authority to regulate the use of methyl bromide determined that no further strengthening is needed. The restricted material permit process

administered by the county agricultural commissioners provides adequate authority for imposing restrictions beyond state recommendations to address local conditions. The permit conditions imposed by the county agricultural commissioners provide adequate local control allowing sufficient flexibility to impose additional restrictions if necessary.

Based on monitoring conducted since the promulgation of emergency regulations in 1992, additional regulations are currently being developed for structural uses of methyl bromide to ensure that off-site ambient air levels meet the targeted exposure value in all cases.

DPR will continue to evaluate the need to alter restrictions on the use of methyl bromide if data become available that indicates changes should be made.

Appendix

Differences Between Methodology Used by the Department of Pesticide Regulation and the California Air Pollution Control Officers Association in Calculating Buffer Zones Around Emission Sites

The California Air Pollution Control Officers Association (CAPCOA) procedure uses historical weather data and determines the maximum concentration at each receptor over an entire weather year. This produces a severe worst-case exposure scenario. The Department of Pesticide Regulation (DPR) method uses a single, standard weather scenario consisting of low wind speed and constant wind direction over the entire 24-hour period. It also assumes a fixed atmospheric stability which is sometimes greater and sometimes less than the stability used by the CAPCOA procedure.

There are significant reasons why the CAPCOA procedure was not appropriate for calculating buffer zones for methyl bromide field fumigations. First is the frequency of emission. The CAPCOA procedure was developed for stationary, continuous emission facilities, such as smokestack releases from a manufacturing plant, and does not take into account that industrial emissions differ significantly from methyl bromide emissions. In contrast to continuous industrial emissions, methyl bromide field fumigations are transient because the applications are conducted at any single location only a few days a year or less with the resulting emissions occurring for a few days or less. Another characteristic of methyl bromide fumigation that makes the CAPCOA procedure a poor fit is the variation in emission rate. The amount of material released by an industrial site is usually constant, independent of the weather; for example, 100 pounds per hour is emitted no matter if the wind is blowing 2 or 20 miles per hour, or the temperature is 40 or 100 degrees. This is not the case with methyl bromide. More methyl bromide is emitted in warmer weather because the emissions are governed by adsorption and diffusion through soil. In the CAPCOA procedure, cold, stable air is a worst-case weather condition and requires the largest buffer zone. As discussed above, these same conditions produce lower emissions of methyl bromide. Therefore, winter temperatures, producing lower emission rates, offset the need for larger buffer zones prescribed by CAPCOA procedure.

At the time of determining buffer zones, DPR used the most recent version of the U.S. Environmental Protection Agency's Industrial Source ComplexShort Term (ISCST) computer model (90346). Since then, the ISCST model has been updated twice with version 3 (95250) being the most recent revision. The ISCST version 3 has not been empirically demonstrated for any chemical. Further, the buffer zones calculated by the ISCST model used by DPR were verified by field monitoring tests. Based on the methodology employed by DPR, the accuracy of the first version of ISCST provides a conservative manner to calculate buffer zones. DPR will continue to evaluate the third version of the ISCST and other appropriate computer simulations. The need to use the new computer model will be based on validation and enhancement of precision and accuracy.